

FOOT-FLAGGING DISPLAYS OF SOME AUSTRALIAN FROGS.

Memoirs of the Queensland Museum 32(1): 302, 1992.— Visual displays involving movements of the feet have been recorded for four anuran species: *Hylodes asperus* (Leptodactylidae), *Staurois parvus* (= *suberlinguis*) and *S. latopalmaris* (Rauidae), and *Taudactylus eungellensis* (Myobatrachidae) (Davison, 1984; Harding, 1982; Heyer et al., 1990; Winter & McDonald, 1986). All of these species are diurnal and live along rainforest streams. This led Heyer et al. (1990) to suggest that visual displays might be a substitute for vocal communication in response to noisy streamside environments where vocal signals are difficult to hear, and may be less risky for frogs that have easy access to a safe refuge. They also noted morphological similarities between *Hylodes asperus* and the Australian hyliid *Litoria nannotis*, and questioned whether *L. nannotis* also might exhibit visual displays.

In this note we confirm that *L. nannotis* does exhibit foot-flagging displays, and describe visual displays by three other Australian hyliid frogs. These include the first records of nocturnal foot-flagging and foot-flagging displays exhibited outside a rainforest environment. Field observations were made in the wet tropics of northern Queensland and in northern New South Wales, between March 1989 and March 1992.

***Litoria genimaculata*:** Three males were observed displaying on mossy rocks next to Birthday Ck, an upland rainforest stream in Mt Spec National Park. Observations were made over a 15 minute period beginning at 1100h on 16.2.90. One male slowly raised the right rear leg, stretched it out perpendicular to the body and rapidly vibrated the foot on a vertical plane with the toes outstretched. It then leapt onto a second male about 1m away. This second male retreated a further metre and exhibited the same display, once with each rear foot. A third male perched within 50cm then displayed vigorously more than a dozen times, with no apparent sequence of use of the two feet. There followed a series of leaps onto each other, several wrestling bouts, and sporadic displays by all three males until they dispersed approximately 15 minutes after the displays were initiated. All of the males called continuously during these bouts.

***Litoria nannotis*:** Observations were made over a two hour period in November, 1990, on captive specimens maintained in a large aquarium. Visual displays were initiated by a resident male when a second male was placed into the same aquarium. Immediately following the introduction, the resident male called vigorously as he approached the intruder, and then extended the right rear leg out and back in an arc, spreading the toes to reveal the webbing, before returning the leg to the side of the body. This display was repeated continuously with both back legs until the intruder retreated into a crevice. The display was reinitiated each time the intruder appeared. Male *L. nannotis* have been observed in the field to wave their front legs in an arc above the head in similar inter-male displays (A. Dennis, pers. comm.).

***Litoria rheocola*:** Three males were observed displaying along rainforest streams in the vicinity of Mt Finnigan, northern Queensland. All observations were made at night between 2200 and 2330 on 17.12.91. All involved interactions between calling males. The first male was perched on a leaf at a height of 38cm and facing another calling male 40cm away. The first male waved its front right foot twice in an arc over its head,

it then made two rapid flicks with the rear leg so that the leg was extended fully, in a lateral plane perpendicular to the long axis of the body, and returned immediately to the side of the body. A second male displayed only with the rear legs, exhibiting seven similar leg flicks in four minutes. Six flicks were with the left leg and one with the right. A third calling male was observed for five minutes and did not display until another male called one metre away. It immediately began displaying with both rear legs in the manner described above. These displays were observed by moonlight.

***Litoria fallax*:** Observations were made between 2150 and 2210h on 01.01.91 in the vicinity of Brays Ck, northern NSW, under well-moonlit conditions. The interaction was between a calling male perched 50cm above the water and a satellite, non-calling male, initially perched 35cm away. The calling male began a rapid clicking encounter call, when approached from behind by the second male. A wrestling bout ensued for approximately one minute during which the first male called continuously and ended with the second male sitting behind and facing the same direction as the first, about 10cm lower on the same branch. The first male then foot-flagged by alternately extending rear legs, starting with a stretch sideways and slowly moving each leg through a backward arc to end in the lateral resting position. This was repeated seven times, ending when the second male leaped away. The remaining male resumed calling four minutes later. No species reported here has brightly coloured webbing between the toes.

The hyliid species reported here to exhibit foot flagging behaviour are all nocturnally active and all use vocalisations to attract conspecific females. Displays were only observed in the presence of rival males. Isolated males, or males in the presence of females, have not been observed displaying.

The functional significance of foot-flagging appears to be related more to male-male aggression than to courtship. Previously reported displays may also prove to have an aggressive rather than a courtship function. More investigations of frog behaviour may reveal a greater diversity of visual displays than previously suspected. Also, observations are required to determine the effect of light intensity (moonlight) on visual displays in nocturnally active frogs.

K. McDonald and A. Richards assisted in the field. Field work was funded by ARC grants A18715284 and A18931875 to R. Alford, and a grant from the Wet Tropics World Heritage Agency. C. James was supported by an Australian Post-graduate Research Award.

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